



University of
Strathclyde
Business
School

Tax Competition for FDI with Multiple Targets

Ben Ferrett

University of Loughborough

Ian Wooton

University of Strathclyde, CEPR and CESifo



Assumptions

1. Across a number of industries there is a pool of potential inward investors
 - several firms that could create jobs in a depressed area
2. Governments are constrained as to the number of investors they may target with incentives for FDI
 - have limited resources to spend on preparing incentive packages for potential investors

As a result, each government is assumed to target a single firm in its attempt to attract FDI

- Will two governments ever compete with each other in targeting the same firm?



Model

- 2 countries, A and B
 - V_i , value country i places on FDI by either firm
 - assume that $V_B - V_A > 0$
- 2 firms, 1 and 2
 - Π_{ij} , variable profit of firm j in country i
 - independent of location of other firms
 - only one plant for each firm
- $\Gamma_j \equiv \Pi_{Aj} - \Pi_{Bj}$, country A 's geographic advantage over country B for firm j
 - $V_B > \Gamma_j$, $V_A > -\Gamma_j$, $j \in \{1, 2\}$
 - countries value FDI enough that bids can offset any geographic advantage of their rivals



Game

3 stages

1. 2 host countries simultaneously choose which firm to target
2. Countries compete to attract FDI using lump-sum taxes/subsidies
3. Firms produce in winning locations

Game is solved backwards

- assume complete information (initially)

Will the two nations ever directly compete for the same firm?

- simple answer: no



Targeting possibilities

Both countries target firm 1

- firm 1 goes to winning country
- firm 2 follows geographic advantage

details 

Country A targets firm 1 Country B targets firm 2

- A offers tax of Γ_1
 - gets $V_A + \Gamma_1$
- B offers subsidy of Γ_2
 - gets $V_B - \Gamma_2$

Country A targets firm 2 Country B targets firm 1

- A offers tax of Γ_2
 - gets $V_A + \Gamma_2$
- B offers subsidy of Γ_1
 - gets $V_B - \Gamma_1$

Both countries target firm 2

- firm 2 goes to winning country
- firm 1 follows geographic advantage



If both countries target firm 1

- firm 1 goes to winning country
 - if $V_B - V_A > \Gamma_1$
 - country *B* wins and pays subsidy of $V_A + \Gamma_1$
 - gaining $V_B - (V_A + \Gamma_1) > 0$
 - if $V_B - V_A < \Gamma_1$
 - country *A* wins and pays subsidy of $V_B - \Gamma_1$
 - gaining $V_A - (V_B - \Gamma_1) > 0$
- firm 2 follows geographic advantage
 - if $\Gamma_2 > 0$
 - firm 2 invests in country *A* which gains V_A
 - if $\Gamma_2 < 0$
 - firm 2 invests in country *B* which gains V_B



Outcomes of the game

Consider the patterns of geographic advantage that will generate different bidding Nash Equilibria (NE).

Examples (all with $V_A = 6$, $V_B = 9$)

$$\Gamma_1 = 1, \Gamma_2 = 2$$

		Country B	
		1	2
Country A	1	(6,1) [1,1]	(8,5) [1,1]
	2	(10,7) [1,1]	(7,0) [2,0]

2 NE: (2,1) Pareto dominates (1,2)

$$\Gamma_1 = 5, \Gamma_2 = 1$$

		Country B	
		1	2
Country A	1	(8,0) [2,0]	(11,8) [1,1]
	2	(7,4) [1,1]	(6,2) [1,1]

Unique NE matches relative geographic advantage

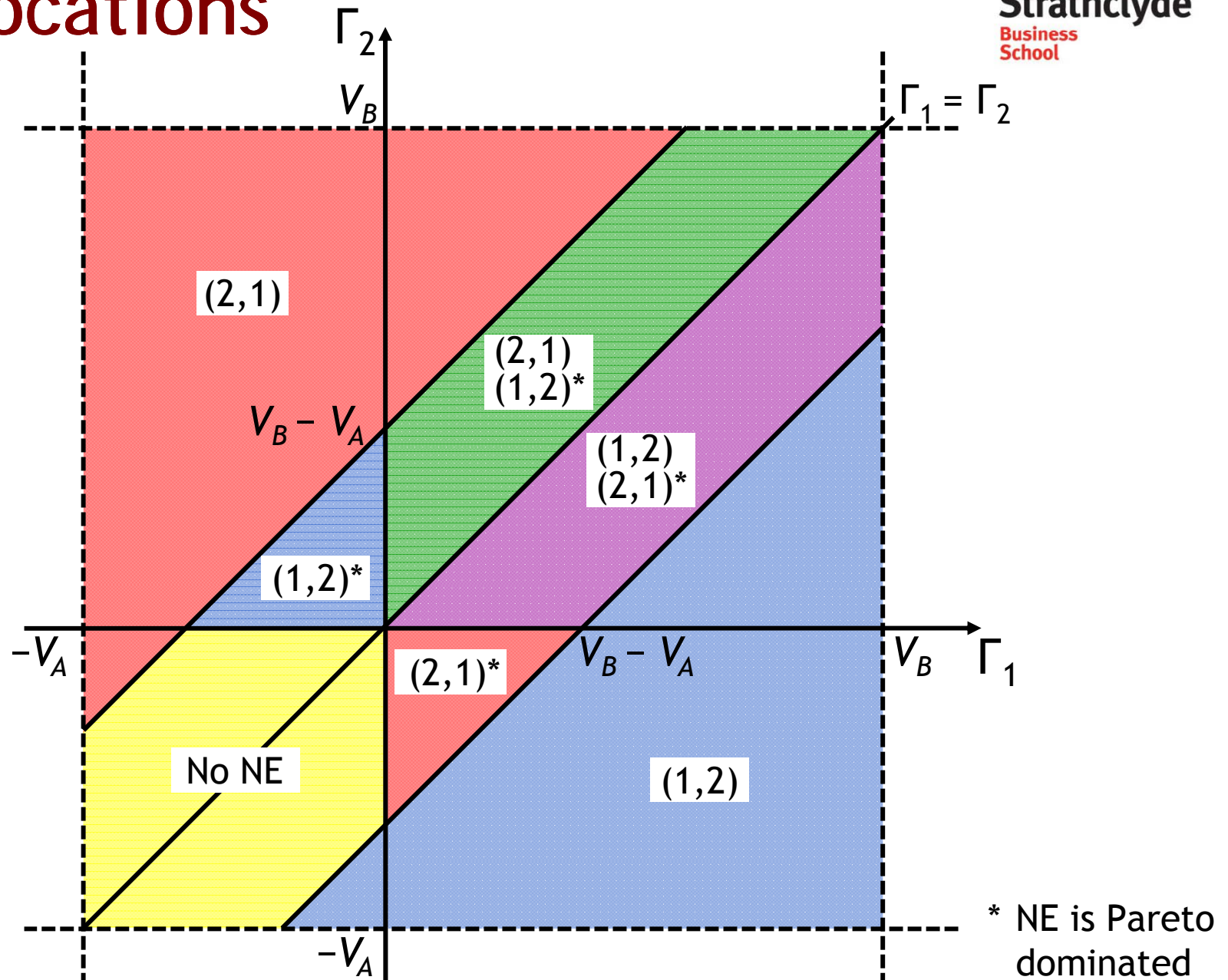
$$\Gamma_1 = -2, \Gamma_2 = -4$$

		Country B	
		1	2
Country A	1	(0,14) [0,2]	(4,13) [1,1]
	2	(2,11) [1,1]	(0,16) [0,2]

No NE: B wants fight but A doesn't



FDI Locations





Summary of outcomes

Where a Nash equilibrium exists, each country targets a different firm.

- when there are 2 Nash equilibria, the efficient one (where country A attracts the firm for which it has the larger geographic advantage) Pareto dominates the other
- if the sole Nash equilibrium is converse to relative geographic advantage, it is Pareto dominated

If we are to find outcomes where both countries compete for the same firm in equilibrium, we must introduce something more

- let's try uncertainty...



Uncertainty over firm 2

Assume Γ_1 , geographic advantage in firm 1, is known

- established industry
 - continue to assume $V_B > \Gamma_1$ and $V_A > -\Gamma_1$
 - both nations would benefit from FDI from firm 1

Let Γ_2 , geographic advantage in firm 2, be uncertain

- new industry getting different benefits from hosts
 - e.g., low wages, skills, infrastructure, etc.

Countries have to choose whether to target the known or unknown industry

- valuations of FDI are the same for both firms
 - what they have to bid to attract FDI is unknown

Can we find situations where same firm is targeted?



Nobody cares about firm 1

Suppose that $V_B - V_A = \Gamma_1$

- if both target this firm, either might win
 - A's bid is $V_B - \Gamma_1$ ($= V_A$, bid equals valuation)
 - B's bid is $V_A + \Gamma_1$ ($= V_B$, bid equals valuation)
 - whoever wins gets no benefit from FDI
 - firm gets V_B wherever it goes in race to bottom
 - bigger bid by B or geographic advantage of A
- if one country targets firm 1, other should bid for 2:
 - A's bid is $-E(\Gamma_2)$ and it gets $V_A + E(\Gamma_2) > 0$
 - B's bid is $E(\Gamma_2)$ and it gets $V_B - E(\Gamma_2) > 0$
 - opportunity cost of competition for firm 1
 - neither country wants to compete for firm 1

		Country B	
		1	2
Country A	1		→
	2	↓	



Outcomes for firm 2

If beliefs are same and $E(\Gamma_2) \in [0, 2(V_B - V_A)]$

- no desire to compete for firm
 - each country should bid for different firm
 - NE of $[1, 2]$ and $[2, 1]$

		Country B	
		1	2
Country A	1	↓	→
	2	←	↑

If $E(\Gamma_2) > 2(V_B - V_A)$

- if B bids for firm 2, A believes it will win contest
 - and also get firm 1, as $\Gamma_1 = 0$
 - payoff to A of $2V_A - V_B + E(\Gamma_2) > V_A + \Gamma_1$
 - A has dominant strategy of bidding for 2

		Country B	
		1	2
Country A	1	↓	→
	2	←	↓

If $E(\Gamma_2) < 0$

- if A bids for firm 2, B believes it will win contest
 - though does not get firm 1, as $\Gamma_1 = 0$
 - payoff to B of $V_B - V_A - E(\Gamma_2) > V_B - \Gamma_1$
 - B has dominant strategy of bidding for 2

		Country B	
		1	2
Country A	1	↓	→
	2	←	↑

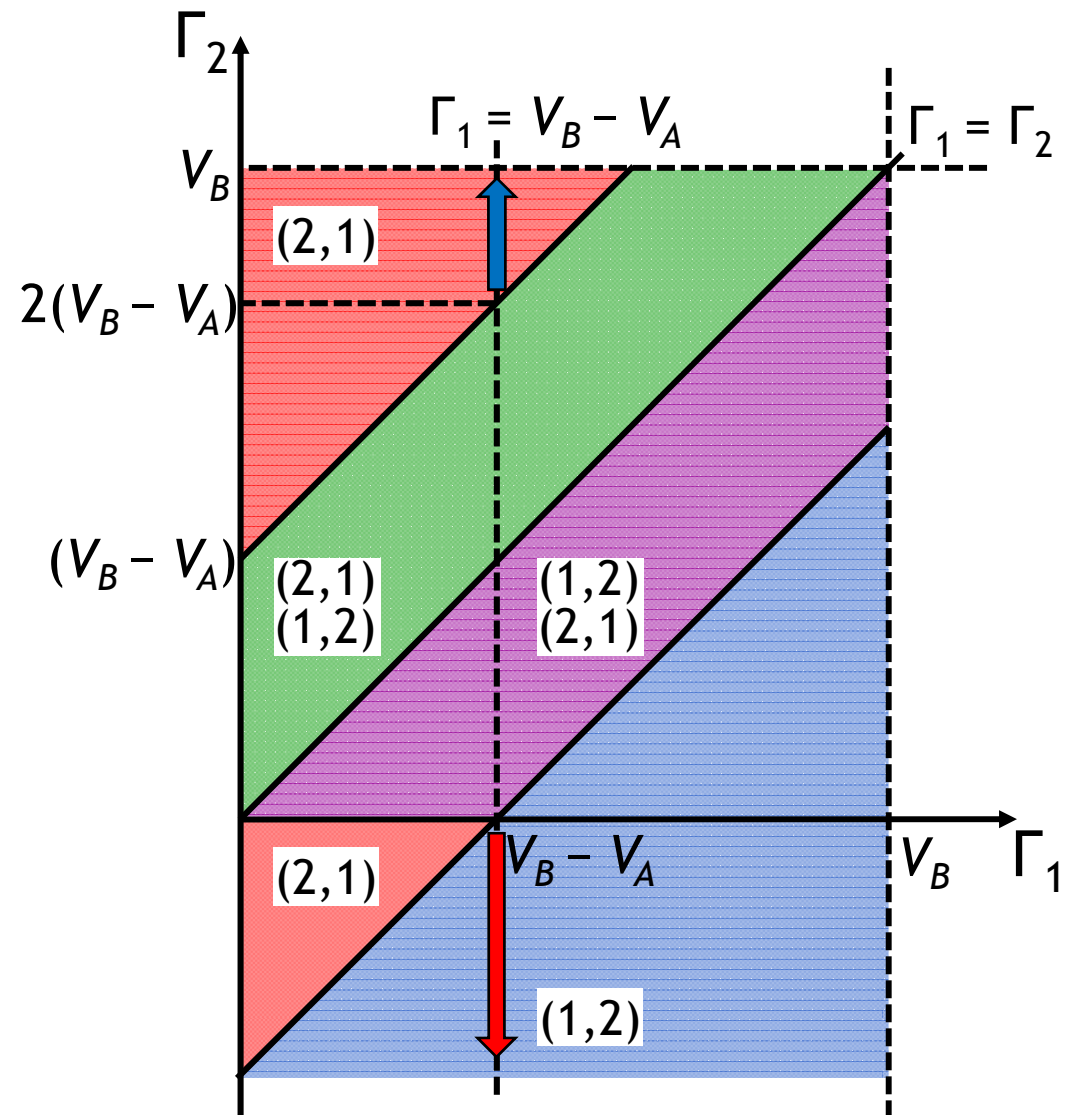


FDI Locations

Thresholds for changes in bidding

- $E(\Gamma_2) > 2(V_B - V_A)$
 - dominant strategy of 2 for country A \uparrow
- $E(\Gamma_2) < 0$
 - dominant strategy of 2 for country B \downarrow

Both will bid for the same firm only if have different, optimistic expectations of geographic advantage

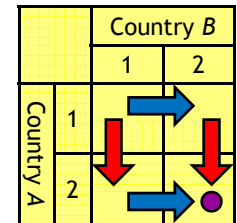




Competing for the same firm

Suppose that each country has more optimistic view of its geographic advantage in firm 2

- country A: $E_A(\Gamma_2) = 2(V_B - V_A) + \varepsilon > 0$
 - dominant strategy of targeting firm 2
- country B: $E_B(\Gamma_2) = -\varepsilon < 0$
 - dominant strategy of targeting firm 1



Expected outcomes (firm 1 locates in A as $\Gamma_1 > 0$)

- bids are $(V_B - E_A(\Gamma_2), V_A + E_B(\Gamma_2))$
 - firm chooses location based upon actual Γ_2
 - locates in A if $V_B - E_A(\Gamma_2) + \Gamma_2 > V_A + E_B(\Gamma_2)$
- under certainty should locate in A if $V_B + \Gamma_2 > V_A$
 - $E_A(\Gamma_2) - E_B(\Gamma_2)$, divergence between expectations